

IN THE SPECIFICATION:

Please replace the Summary of the Invention section beginning on page 3, line 6 of the current specification with the following amended Summary of the Invention.

Summary of the Invention

According to one aspect of the present invention there is provided a method of delivering a substance into a cellular organism, the method comprising the steps of:

providing the substance in an ionized aerosol form at a delivery region of the organism; and

applying magnetic energy to the delivery region to effect enhanced delivery of the ionized aerosol substance to the cellular organism.

Preferably the application of magnetic energy is effected by applying a pulsed magnetic field. More preferably the pulse magnetic field is asymmetric.

According to another aspect of the invention there is provided a method of delivering a substance into a cellular organism, the method comprising the steps of:

providing the substance in a liquid or cream form at a delivery region of the organism;

applying ultrasonic energy to the delivery region to enhance delivery of the cream or liquid substance to said organism; and

simultaneously applying magnetic energy and electrical energy to the delivery region to effect delivery of the cream or liquid substance to the cellular organism.

Preferably the application of ultrasonic energy to said organism to enhance delivery is promoted by opening the pores of the organism.

Preferably the ultrasonic and magnetic energies are applied simultaneously.

Preferably the application of magnetic energy is effected by applying magnetic fields, the magnetic field is a pulsed magnetic field.

According to a further aspect of the invention there is provided a device for delivering a substance into a cellular organism, the device comprising:

- an aerosol delivery head for providing the substance in an ionized aerosol form at a delivery region of the organism;

- means for applying magnetic energy to the delivery region to effect enhanced delivery of the ionized aerosol substance to the cellular organism.

Preferably the aerosol delivery head provides a sealed compartment about the delivery region.

Preferably the device further comprises a nebulizer operatively coupled to the aerosol delivery head. More preferably the nebulizer comprises:

- a container being adapted to contain a liquid to be nebulized;

- a tubular energy transmitter having one end immersed in the liquid of the container and an opposite end positioned clear of the liquid; and

- an energy source being operatively coupled to the container or the tubular energy transmitter for nebulization of the liquid and being arranged for transmission of energy to the liquid or tubular energy transmitter whereby in operation the transmitted energy forces the liquid toward the opposite end of the tubular energy transmitter where it is nebulized in the form of the aerosol.

Preferably at least one energy transmitter is positioned so that said one end is adjacent the bottom of the liquid.

Preferably the energy transmitter is arranged to allow formation of high frequency vibrations in its wall(s) upon emission of the energy, the high frequency vibrations effecting aerosol formation at the liquid surface at or adjacent the opposite end of the energy transmitter.

Preferably the nebulizer further comprises an aerosol tube coupled to the opposite end of the tubular energy transmitter and having a cross-sectional area such that the static pressure of the aerosol within the aerosol tube induces a pressure drop along the aerosol tube which alone is sufficient to propel the nebulized aerosol through the aerosol tube.

According to yet another aspect of the invention there is provided a device for delivering a substance into a cellular organism, the device comprising:

means for generating ultrasonic energy being adapted to cooperate with a delivery region of the organism to enhance delivery of the substance in a cream or liquid form to said organism;

means for simultaneously applying magnetic energy and electrical energy to the delivery region to effect delivery of the cream or liquid substance to the cellular organism, said ultrasonic generating means being operatively coupled to the magnetic and electrical energy means whereby a synergistic effect is provided by the combination of said means.

Preferably the means for applying magnetic energy is in the form of a pulsed magnetic generator.

The organism of the various aspects of the present invention may be an animal. More particularly, the organism may be a human being. The delivery region may comprise a membrane of the animal or human being. The membrane may comprise skin of the human being. Alternatively, the membrane may comprise a cornea of the human being. The membrane may alternatively comprise a lung of the human being.

According to another aspect of the invention there is a nebulizer comprising:

a container adapted to contact a liquid to be nebulized;
a tubular energy transmitter having one end proximate the container; and
an energy source being operatively coupled to the container for nebulization of the liquid and being arranged for transmission of energy to the liquid which is forced toward an opposite end of the tubular energy transmitter.

Preferably the energy source is positioned below the container.

Preferably said one end of the tubular energy transmitter is immersed in the liquid. Even more preferably the tubular energy transmitter is positioned so that said one end is proximate the bottom of the container. Even still more preferably the tubular energy transmitter vibrates at a frequency to form an aerosol proximate the opposite end of the energy transmitter.

Preferably the nebulizer further comprises an aerosol tube positioned about at least a portion of the tubular energy transmitter and having a cross-sectional area such that the static pressure of the aerosol within the aerosol tube induces a pressure drop along the aerosol tube which propels the aerosol through the aerosol tube. Even more preferably an internal diameter of the aerosol tube is greater than an internal diameter of the tubular energy transmitter at its opposite end. Still more preferably the aerosol tube is positioned so that it is substantially coaxial with the tubular energy transmitter. Even still more preferably the aerosol tube is connected to the opposite end of the tubular energy transmitter.

Preferably the energy source vibrates the liquid proximate the opposite end of the tubular energy transmitter.

Preferably the aerosol tube opens at its upper end into an expansion chamber which in turn communicates with an outlet duct.

Preferably the expansion chamber is adapted to recirculate larger drops of the liquid back into the container.

Preferably the energy source comprises an ultrasonic transducer for transmission of ultrasonic radiation energy. Preferably the ultrasonic transducer has a concave shaped surface. Still more preferably the ultrasonic transducer is arranged to transmit ultrasonic energy to a focal region of the liquid.

Preferably said the one end of the tubular energy transmitter is proximate the focal region. More preferably an internal diameter of the tubular energy transmitter is substantially equal to a diameter of the focal region. Still more preferably the tubular energy transmitter has a higher acoustic impedance than the liquid. Even still more preferably the acoustic impedance of the tubular energy transmitter is high enough to effect minimal acoustic energy loss during transmittal of the energy along the tubular energy transmitter.

Preferably the application of ultrasonic energy is effected by applying ultrasonic fields.

Preferably the application of electrical energy is effected by applying ultrasonic fields.